(12) UK Patent Application (19) GB (11) 2 317 776 (13) A

(43) Date of A Publication 01.04.1998

(21) Application No 9720645.2

(22) Date of Filing 29.09.1997

(30) Priority Data
(31) 96043247 (32) 30.09.1996 (33) KR

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(51) INT CL^6
H04N 5/57

(52) UK CL (Edition P)
H4F FD30A1 FD30A9 FHL
H4T TADX

(56) Documents Cited
None

(58) Field of Search
UK CL (Edition P) H4F FHL , H4T TADX TAMX
INT CL^6 H04N 5/14 5/57
Online: WPI

(54) Image brightness control of a monitor during multi-media mode operation

(57) An image processing apparatus for monitoring, multi-media mode operation has an object to increase brightness of an image by controlling contrast during moving-image mode operation as compared to text mode operation. A mode controller 210 outputs a mode control signal according to mode selection. A control current generator 270 outputs a control current according to the mode control signal. A brightness limiter 250 outputs a brightness control current I21 and a contrast control current I22 according to the control current. A contrast controller 220 outputs an image control signal from the mode control signal and the contrast control current. An image signal processor 230 changes the amplitude of an image signal according to the image control signal. By this invention, during use of the multi-media mode, as the contrast control current is increased, the amplitude of the image control signal is increased. At a result, the brightness of image is enhanced.

FIG.2

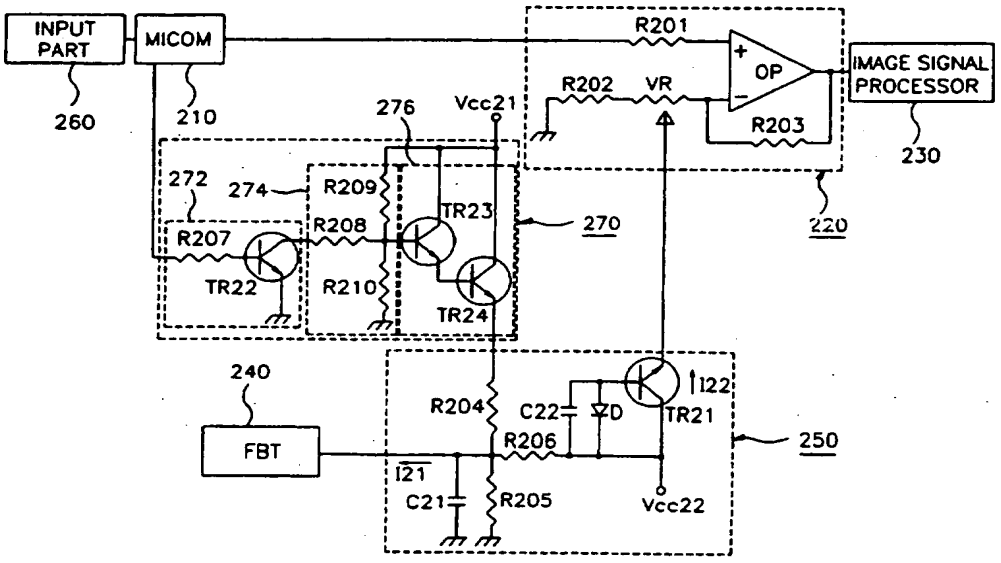

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FIG. 1
PRIOR ART

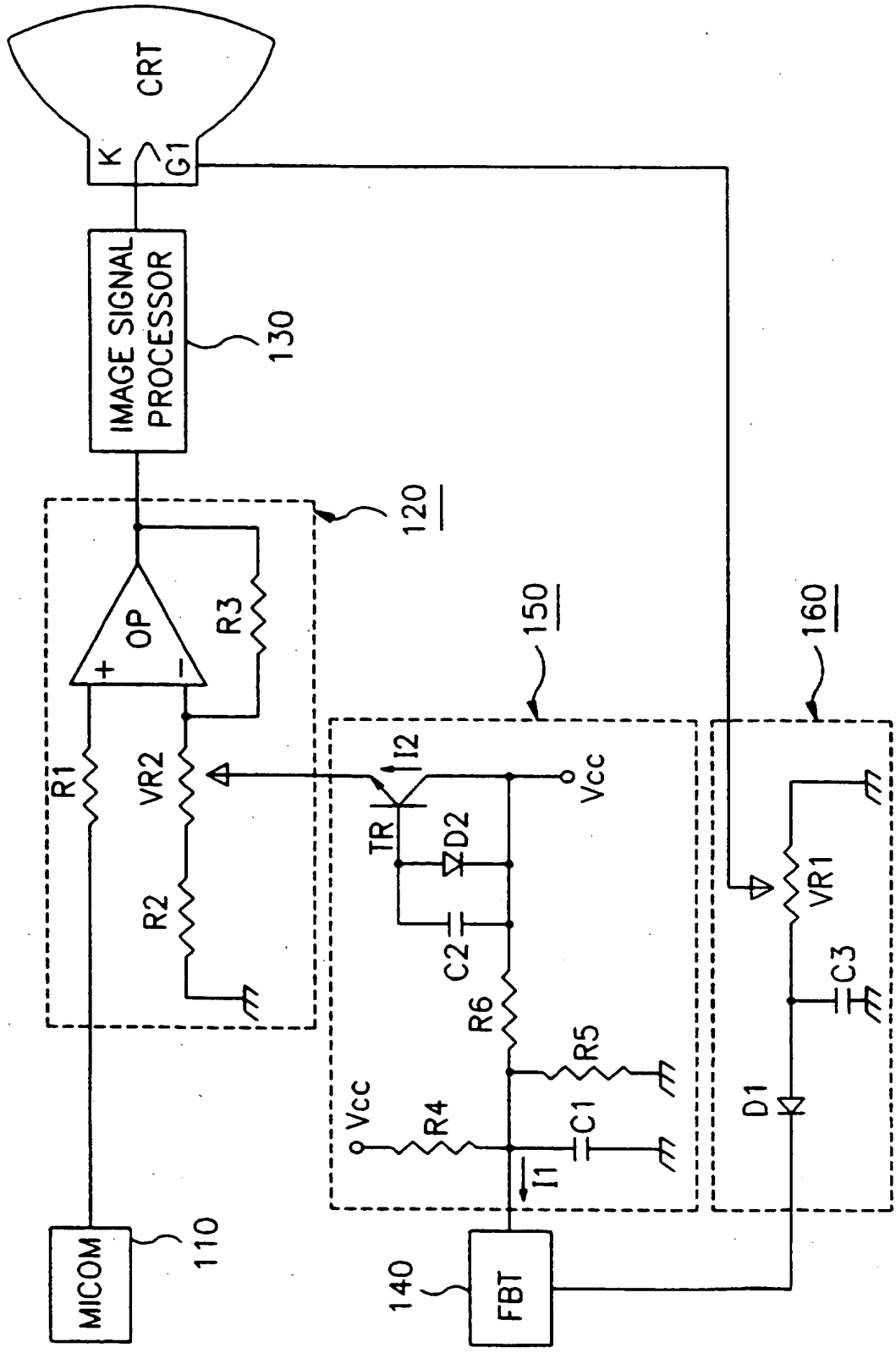

FIG.2

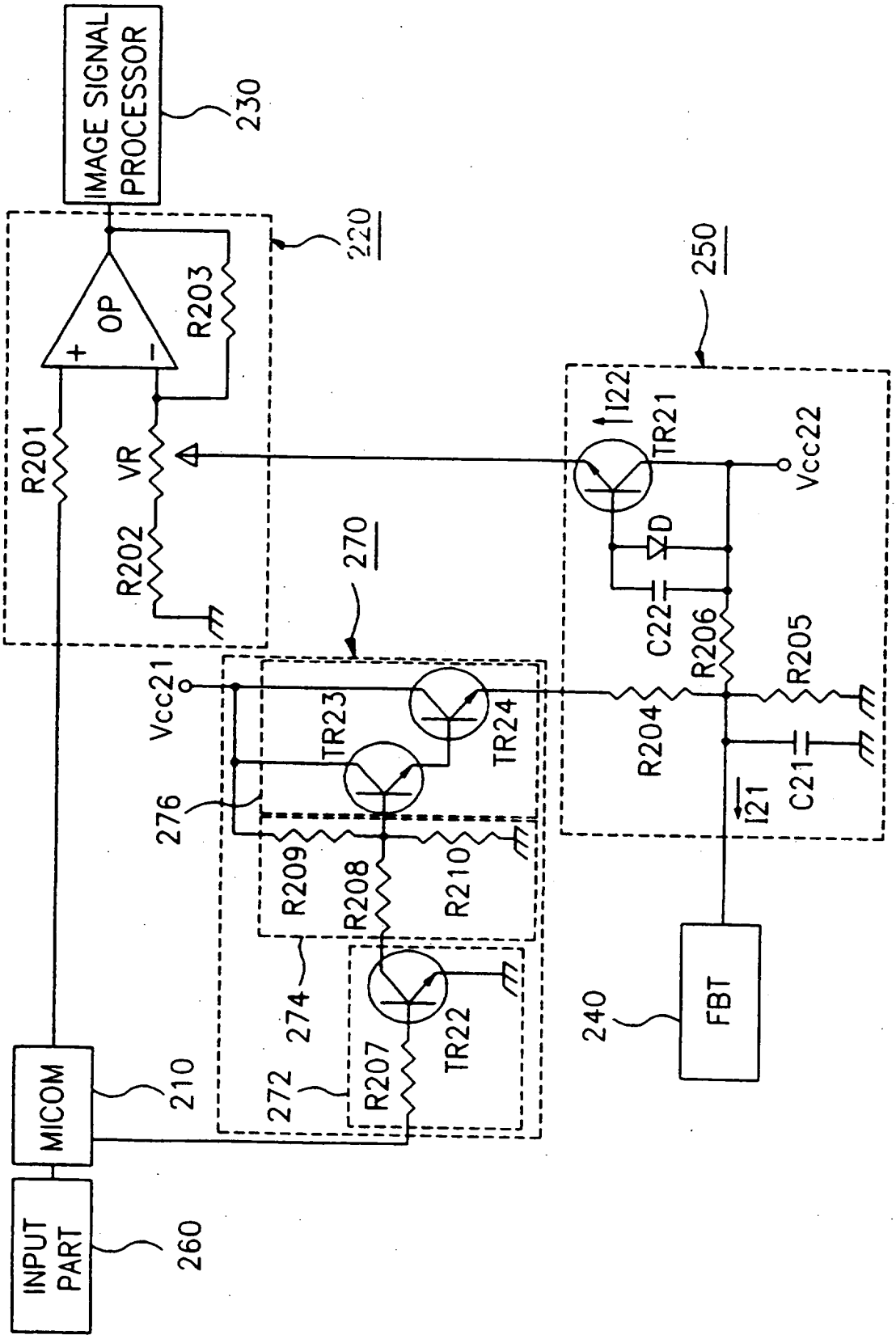
IMAGE SIGNAL PROCESSOR
230
220
OP
+
-
R203
R201
VR
R202
270
250
I22
TR21
Vcc22
D
C22
R206
R205
R204
C21
I21
Vcc21
TR23
TR24
276
R209
R208
R210
274
TR22
R207
272
240
FBT
MICOM
210
INPUT PART
260

IMAGE PROCESSING APPARATUS OF MONITOR FOR MULTI-MEDIA MODE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an image processing apparatus of a monitor, more particularly, to an image processing apparatus of a monitor for multi-media mode for increasing brightness of image according to the needs of a user during use of the monitor for multi-media mode.

2. Prior Art

As shown in Fig. 1, a conventional image processing apparatus of a monitor has a micom 110, a contrast controller 120, an image signal processor 130, a flyback transformer (FBT) 140, an automatic brightness limiter 150, and a brightness regulator 160 so that the conventional image processing apparatus of a monitor controls brightness of image.

The contrast controller 120 outputs an image control signal which controls the level of the image signal in the image signal processor 130. A level-variable DC control signal, which is outputted from the micom 110, is amplified according to a contrast control current being outputted from the automatic brightness limiter 150. The amplified DC control signal is inputted to the image signal processor 130 as the image control signal. If adjustment of contrast is needed, a variable resistor

VR2 is regulated.

The automatic brightness limiter 150 prevents the FBT 140 from being overloaded due to a high anode current. If the current variation in the FBT 140 is above a limit current, a brightness control voltage is lowered and fedback to an input terminal of the FBT 140. At a result, a output voltage of the FBT 140 is lowered and applied to the anode electrode so that the anode current is limited within an allowable current range. That is, the automatic brightness limiter 150 may limit the anode current from the FBT 140 by controlling a brightness control current I1. Also, the contrast control current I2, the level of which varies according to the brightness control current I1, is inputted to the contrast controller 120 so that the contrast control current I2 controls the level of the DC control signal from the micom 110. Therefore, the brightness of image varies according to the brightness control current I1 and the contrast control current I2.

The brightness regulator 160 regulates the brightness of image. If a horizontal deflection circuit (not shown) operates, the FBT 140 generates a high voltage and applies the high voltage to a control grid G1, focus grid, and screen grid of a cathode ray tube (CRT). Here, the high voltage is about -120 Vp-p. The high voltage is rectified through a diode D1 negatively. The negative-rectified high DC voltage is smoothed by a

smoothing capacitor C3 and is applied to the control grid G1 of the CRT. The negative DC voltage on the control grid G1 controls the brightness of image by controlling an amount of electrons radiated from a cathode K of the CRT. If adjustment of brightness is needed, a variable resistor VR1 is regulated. The regulation of variable resistor VR1 varies the level of the negative DC voltage being applied to the control grid G1. At this time, the higher the negative DC voltage is, the higher the power blocking radiation of the electrons is. As a result, the electrons arriving at the fluorescent screen of the CRT are fewer so that the image is darker.

However, when an image is displayed on a screen which is driven by a multi-media mode card with low resolution, the level of an image signal provided by the multi-media mode card with low resolution is lower than the level of an image signal provided by a general personal computer so that brightness of an image in a monitor for multi-media mode deteriorates.

SUMMARY OF THE INVENTION

To solve the above-mentioned problem, the present invention provides an image processing apparatus of a monitor for multi-media mode which makes an image brighter during multi-media mode than during normal mode when a user wants to receive multi-media service with low resolution.

The present invention has a mode controlling part which outputs a mode control signal according to multi-media modes, a control current generating part which divides a predetermined bias-voltage according to the mode control signal and outputs a control current by means of the divided bias-voltage, a brightness limit controlling part for outputting brightness control current and contrast control current amplitudes of which are changed according to the control current, a contrast controlling part for amplifying the mode control signal by means of the contrast control current and outputting the amplified mode control signal as an image control signal, and an image signal processing part for changing amplitude of a signal by means of the image control signal.

The control current, which is outputted from the control current generating part, controls the brightness control current and the contrast control current. If the amplitude of the control current is higher, amplitudes of the brightness control current and the contrast control current are also higher. The contrast control current with high amplitude controls amplitude of the mode control signal. Then, amplitude of the image control signal, which is an output signal of the contrast controlling part, is higher. As a result, the brightness of image is enhanced.

With the present invention during use of the multi-

media mode with low resolution, by increasing the contrast control current being inputted to the contrast controlling part, image is brighter.

BRIEF DESCRIPTION OF THE DRAWINGS

The above object and advantage of the present invention will become more apparent by describing in detail a preferred embodiment thereof with reference to the attached drawings in which:

Fig. 1 is a circuit diagram showing a conventional image processing apparatus of monitor, and

Fig. 2 is a circuit diagram showing an image processing apparatus of monitor for multi-media mode according to a preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 2 is a circuit diagram showing an image processing apparatus of monitor for multi-media mode according to a preferred embodiment of the present invention. The image processing apparatus has a micom 210, a contrast controller 220, an image signal processor 230, a flyback transformer (FBT) 240, a brightness limiter 250, an input part 260, and a control current generator 270.

The contrast controller 220 has an amplifier OP, resistors R201, R202, R203, and a variable resistor VR.

One terminal of the resistor R210 is connected to output terminal of the micom 210, and the other terminal of the resistor R210 is connected to noninverting terminal of the amplifier OP. One terminal of the variable resistor VR is connected to inverting terminal of the amplifier OP , and the other terminal of the variable resistor VR is connected to one terminal of the resistor R202. The other terminal of the resistor R202 is grounded. One terminal of the resistor R203 is connected to output terminal of the amplifier OP, other terminal of the resistor R203 is connected to inverting terminal of the amplifier OP, thereby output signal of the amplifier OP is fedback to inverting terminal of the amplifier OP. Also, output terminal of the amplifier OP is connected to input terminal of the image signal processor 230.

The brightness limiter 250 has a transistor TR21, resistors R204,R205,R206, capacitors C21,C22, and a diode D. Emitter terminal of the transistor TR21 is connected to the other terminal of the variable resistor VR in the contrast controller 220, and collector terminal of the transistor TR21 is connected to output terminal of a bias-voltage Vcc22. One terminal of the diode D is connected to base terminal of the transistor TR21, and the other terminal of the diode D is connected to output terminal of a bias-voltage Vcc22. One terminal of the capacitor C22 is connected to base terminal of the transistor TR21, and the other terminal of the capacitor

C22 is connected to output terminal of a bias-voltage Vcc22. One terminal of the resistor R206 is connected to output terminal of the bias-voltage Vcc22, and the other terminal of the resistor R206 is connected to input terminal of the FBT 240. One terminal of the resistor R205 is connected to input terminal of the FBT 240, and the other terminal of the resistor R205 is grounded. One terminal of the capacitor C21 is connected to input terminal of the FBT 240, and the other terminal of the capacitor C21 is grounded. Also, one terminal of the resistor R204 is connected to input terminal of the FBT 240, and the other terminal of the resistor R204 is connected to output terminal of the control current generator 270.

The control current generator 270 is divided into a switching part 272 which switches according to DC voltage from the micom 210, a bias-voltage dividing part which divides a predetermined bias-voltage at a predetermined rate according to the switching of the switching part, and a current amplifying part which amplifies an input current due to the divided bias-voltage. A common emitter transistor may be used as the switching part 272. Darlington Circuit may be used as the current amplifying part 276.

As a whole, the circuit of the control current generator 270 is as follows. The control current generator 270 has transistors TR22,TR23,TR24, and

resistors R207,R208,R209,R210. One terminal of the resistor R207 is connected to output terminal of the micom 210, and the other terminal of the resistor R207 is connected to base terminal of the transistor TR22. Collector terminal of the transistor TR22 is connected to one terminal of the resistor R208, and emitter terminal of the transistor TR22 is grounded. The other terminal of the resistor R208 is connected to base terminal of the transistor TR23. One terminal of the resistor R209 is connected to base terminal of the transistor TR23, and the other terminal of the resistor R209 is connected to output terminal of the bias-voltage Vcc21. One terminal of the resistor R210 is connected to base terminal of the transistor TR23, and the other terminal of the resistor R210 is grounded. Collector terminal of the transistor TR23 is connected to output terminal of the bias-voltage Vcc21, and emitter terminal of the transistor TR23 is connected to base terminal of the transistor TR24. Also, collector terminal of the transistor TR24 is connected to output terminal of the bias-voltage Vcc21, and emitter terminal of the transistor TR24 is connected to input terminal of the brightness limiter 250.

The operation of the present invention is as follows. The operation will be described according to two modes. One, a normal mode is related with a text mode. The other, multi-media mode is related with a moving

picture.

Firstly, when a button of the normal mode is pushed, the micom 210 outputs a DC voltage with high level. The transistor TR22, which is a switch, operates. Then, one terminal of the resistor R208 is essentially grounded. As a result, resistors R208,R209,R210 all are in effect. The bias-voltage is divided at a rate according to the values of the resistors R208,R209,R210. At this time, if input voltage at base terminal of the transistor TR23 is defined as Vi1, the input voltage Vi1 is represented as a formula 1.

[formula 1]

$$Vi1 = ((R10*R8)/(R10+R8))/(R9+(R10*R8)/(R10+R8))*Vcc21$$

The transistor TR23 and transistor TR24 is constructed as Darlington Circuit, which is a kind of composite transistor and operates as the current amplifying part for amplifying an input current being inputted to base terminal of the transistor TR23. The input current, which is generated by the input voltage applied to base terminal of the transistor TR23, is inputted to emitter terminal of the transistor TR23. Output current of the transistor TR23 is inputted to base terminal of the transistor TR24. Output current of the transistor TR24, which is the control current, is outputted through emitter terminal of the transistor TR24. The control current, which is inputted to input terminal of the brightness limiter 250, controls a

brightness control current I21 and a contrast control current I22. That is, the control current changes not only amplitude of the brightness control current I21 varying according to the control current but also amplitude of the contrast control current I22 varying according to the brightness control current I21.

Furthermore, the contrast control current I22 is inputted to the contrast controller 220 so that the contrast control current I22 amplifies the DC voltage from the micom 210. An image control signal, which is the amplified DC voltage, is inputted to the image signal processor 230.

Secondly, when a button of the multi-media mode is pushed, the micom 210 outputs a DC voltage with low level. The transistor TR22 which is a switch, does not operate. Then one terminal of the resistor R208 is essentially open. As a result, resistors R209, R210 are in effect. The bias-voltage is divided at a rate according to the values of the resistors R209,R210. At this time if input voltage at base terminal of the transistor TR23 is defined as Vi2, the input voltage Vi2 is represented as a formula 2.

[formula 2]

$$Vi2 = (R10/(R10+R9)*Vcc21$$

If formula 1 and formula 2 are compared, output voltage of the bias-voltage dividing part 274 is higher during the multi-media mode than during the normal mode.

The control current due to the output voltage of the bias-voltage dividing part 274 is amplified as much as a current gain of the Darlington Circuit and is inputted to input terminal of the brightness limiter 250. The more the control current flows, the more the brightness control current I21 flows. Also, the more the brightness control current I21 flows, the more the contrast control current I22 flows.

With the present invention, during use of the multi-media mode with low resolution, by increasing the control current being inputted to the brightness limiter, the brightness control current and the contrast control current increase. At a result, brightness of image is brighter.

While the present invention has been particularly shown and described with reference to particular embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be effected therein without departing from the spirit and scope of the invention as defined by the appended claims.

CLAIMS:

1. An image processing apparatus for monitoring multi-media mode and having an image signal processing part for changing amplitude of a signal by means of an image control signal, the image processing apparatus including:

a mode controlling part which outputs a mode control signal according to multi-media modes;

a control current generating part which divides a predetermined bias-voltage according to the mode control signal and outputs a control current by means of the divided bias-voltage;

a brightness limit controlling part for outputting brightness control current and contrast control current the amplitudes of which are changed according to the control current; and

a contrast controlling part for amplifying the mode control signal by means of the contrast control current and outputting the amplified mode control signal as the image control signal.

2. The image processing apparatus of monitor for multi-media mode as claimed in claim 1, wherein the mode controlling part includes:

an input part for selecting a mode; and

a micom for outputting the mode control signal

according to the mode selection of the input part;

3. The image processing apparatus of monitor for multi-media mode as claimed in claim 2, wherein the mode control signal is a high level DC voltage or a low level DC voltage.

4. The image processing apparatus of monitor for multi-media mode as claimed in claim 1, wherein the control current generating part includes:

a switching part which switches according to the mode control signal;

a bias-voltage dividing part which divides the predetermined bias-voltage at a predetermined rate according to the switching of the switching part; and

a current amplifying part which amplifies an input current generated from the divided bias-voltage and outputs the control current.

5. The image processing apparatus of monitor for multi-media mode as claimed in claim 4, wherein the switching part is a common emitter transistor in which base terminal thereof is connected to output terminal of the mode controlling part, and collector terminal thereof is connected to input terminal of the bias-voltage dividing part.

6. The image processing apparatus of monitor for multi-media mode as claimed in claim 5, wherein the switching part further includes a resistor between output terminal of the mode controlling part and input terminal of the common emitter.

7. The image processing apparatus of monitor for multi-media mode as claimed in claim 4, wherein the bias-voltage dividing part includes:

a first resistor in which one terminal thereof is connected to output terminal of the switching part , and other terminal thereof is connected to input terminal of the current amplifying part;

a second resistor in which one terminal thereof is connected to output terminal of the bias-voltage ,and other terminal thereof is connected to input terminal of the current amplifying part; and

a third resistor in which one terminal thereof is grounded, and other terminal thereof is connected to input terminal of the current amplifying part.

8. The image processing apparatus of monitor for multi-media mode as claimed in claim 4, wherein the current amplifying part is Darlington Circuit in which input terminal thereof is connected to output terminal of the bias-voltage dividing part, and output terminal thereof

is connected to input terminal of the brightness limit controlling part.

9. The image processing apparatus of monitor for multi-media mode as claimed in claim 1, wherein the control current generating part includes:

a first resistor in which one terminal thereof is connected to output terminal of the mode controlling part;

a first transistor in which base terminal thereof is connected to other terminal of the first resistor, emitter terminal thereof is grounded, and collector terminal thereof is output terminal;

a second resistor in which one terminal thereof is connected to the collector terminal of the first transistor;

a third resistor in which one terminal thereof is grounded;

a fourth resistor in which one terminal thereof is connected to output terminal of a predetermined bias-voltage;

a second transistor in which base terminal thereof is connected to other terminal of the second resistor, other terminal of the third resistor, and other terminal of the fourth resistor, collector terminal thereof is connected to the output terminal of the bias-voltage, and

emitter terminal thereof is output terminal; and

a third transistor in which base terminal thereof is connected to the emitter terminal of the second transistor, collector terminal thereof is connected to the output terminal of the bias-voltage, and emitter terminal thereof is output terminal;

thereby, for outputting the control current to input terminal of the brightness limit controlling part.

10. An image processing apparatus capable of monitoring for multi-media modes substantially as hereinbefore described with reference to and as shown in Figure 2 of the accompanying drawings.

The Patent Office

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Application No: GB 9720645.2 **Examiner:** John Coules
Claims searched: 1-10 **Date of search:** 21 January 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): H4F FHL; H4T TADX,TAMX

Int Cl (Ed.6): H04N 5/14,5/57

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
	None	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.